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Indian Standard
ELECTROTECHNICAL VOCABULARY
PART XXX OVERHEAD TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Indian Standard

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PART XXX OVERHEAD TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY

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ELECTROTECHNICAL VOCABULARY

PART XXX OVERHEAD TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY

0. FOREWORD

0.1 This Indian Standard (Part XXX) was adopted by the Indian Standards Institution on 11 June 1971, after the draft finalised by the Electrotechnical Standards Sectional Committee in consultation with the Power Installation and Maintenance Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard (Part XXX) covers definitions of terms relating to overhead transmission and distribution of electrical energy.

0.3 This standard is one of the series of Indian Standards on electrotechnical vocabulary.

0.4 This standard largely follows IEC Pub 50 (25) (1965) ' Generation, transmission and distribution of electrical energy ', brought out by International Electrotechnical Commission, IEC.

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1. SCOPE

1.1 This standard (Part XXX) covers definitions of terms applicable to overhead transmission and distribution of electrical energy.

1.2 This standard does not cover terms relating to underground cable net works.

2. GENERAL TERMS

2.1 Transmission of Electrical Energy — The conveying of electrical energy in bulk, generally over a long distance for further distribution.

2.2 Distribution of Electrical Energy — The conveying of electrical energy to points of consumption.

2.3 Power System — A system comprising installations of generators, transformers, switchgear, lines, accessories and structures used for the generation, conversion, transformation, transmission and distribution of electrical energy.

2.4 Electrical Installation — Mechines, apparatus, lines and associated equipment used for the generation, conversion, transformation, transmission, distribution and utilization of electrical energy and associated civil engineering works in buildings.

2.5 Electrical Equipment — The electrical machines, apparatus and circuits forming part of an electrical installation or a power system.

2.6 Outdoor Electrical Equipment — Electrical equipment suitable for installation in open air.

2.7 Indoor Electrical Equipment — The electrical equipment not suitable for installation in open air.

3. SUBSTATIONS

3.1 Substation — An assemblage of equipment at one place including any necessary housing for the conversion, transformation or control of electrical energy and for connection between two or more circuits.

3.2 Transforming Substation — A substation which includes transformers.

3.3 Interconnecting Substation — A substation into which are led one or more lines used for connecting between two or more networks.

3.4 Distribution Substation — A substation used for feeding a distribution network.

3.5 Kiosk — A substation in which all the apparatus is housed in one weatherproof metal enclosure.

3.6 Package (Unit) Substation — A substation in which the switchgear, the busbars and the transformers are all contained in a single robust metal enclosure.

3.7 Mobile Substation — A substation permanently mounted on one or more vehicles.

3.8 Transportable Substation — A substation comprising individual items of equipment which can be readily moved into position for temporary use.

3.9 Link-Box — A box installed underground with a removable cover containing removable links for the connection or isolation of service circuits.

3.10 Distribution Pillar — A totally enclosed structure or cubicle containing bus-bars connected to incoming and outgoing distribution feeders controlled through links or fuses.

3.11 Switch Bay — The space in a substation or power station in which the switching equipment for the control of a single outlet for a line or transformer is installed.

3.12 Cell — Switch bay or part of a switch bay separated from neighbouring switch bays by partitions.

3.13 Control Room — A room in which control boards are installed.

3.14 Bus-Bar — An electric conductor that serves as a common connection for one polarity or phase of several circuits. Two or more bus-bars, which serve all polarities or phases of the circuits, are also collectively called a 'Bus'.

Bus-bars are distinguished from Connection-bars (also referred to as 'bus-connections'), which inter-connect devices in the same circuit or connect the circuit to the bus-bars.

3.15 Main Bus-Bars — Installations are very often provided with two or more sets of bus-bars, arranged for various uses. 'Main bus-bars' is that particular set of bus-bars which are proposed to be energized during normal operation.

3.16 Transfer Bars — Auxiliary bus-bars connected by a circuit-breaker to the main bars. Any circuit can be transferred to the transfer bars by means of an isolator so that the circuit can be controlled by a circuit-breaker connecting the transfer bars to the main bars during periods when the circuit-breaker normally controlling that circuit is out of commission.

3.17 Reserve Bars — A second set of bus-bars to which each circuit, with its own circuit-breaker, can be connected by means of bus-bar selection isolators.

3.18 Troughing — A covered channel in which cables are laid to protect them against external mechanical effects.

3.19 Tube (Pipe) (Duct) — Tube, pipe or duct through which cables are drawn to protect them against external mechanical effects or to facilitate the crossing of obstacles.

4. NETWORKS

4.1 Network — An individual electrical system in which all the conductors and apparatus are interconnected.

4.2 Shunt or Parallel System of Distribution — A system of distribution in which all the consuming devices are connected so as to have the same nominal voltage applied to them.

4.3 Series System of Distribution — A system of distribution in which the consuming devices to be supplied are so connected that they all carry the same current.

4.4 Isolated Neutral System — A system which has no intentional connection to earth except through indicating, measuring, or protective devices of very high impedance.

4.5 Earthed Neutral System — A system in which the neutral is connected to earth, either solidly, or through a resistance or reactance of value low enough to reduce materially transient oscillations and to give a current sufficient for selective earth fault protection.

4.6 Resonant Earthed System — A system earthed through a reactor. the reactance being of such a value that during a single line-to-earth fault, the power-frequency inductive current passed by this reactor essentially neutralizes the power-frequency capacitive component of the earth-fault current.

NOTE — With resonant earthing of a system, the net current in the fault is limited to such an extent that an arcing fault in air would be self-extinguishing.

4.7 System with Solidly Earthed Neutral — A system with one or more transformers or generators having the neutral point(s) earthed in such a way that the voltage drop along the connection to earth is negligible compared with the nominal voltage of the system under all possible operating conditions.

4.8 Earth Return System — A system in which one of the conductors is replaced by earth.

4.9 Radial Circuit — A line emanating from a source of supply and terminating at a point to be supplied which, together with any other points to be supplied by the line, do not have a supply available to them in more than one direction.

4.10 Radial Network — A network or part of a network which is wholly or mainly composed of radial circuits.

4.11 Radially Operated Network — A radial network, or a network constructed as a ringed or a meshed network, but operated in such a way that the points to be supplied are not supplied in more than one direction continuously, but the alternative supply is only connected by closing switching devices which are normally open.

4.12 Meshed Network — A network or part of a network which is wholly or mainly composed of ring circuits all or most of which emanate from and terminate at different sources of supply, or any more complex system of multiple ring circuits with multiple supply sources.

4.13 Mesh-Operated Network — A meshed network in which all of the switching devices are normally closed so that all or most of the points to be supplied are each supplied from more than one source of supply continuously.

4.14 Ring Circuit — A circuit emanating from a source of supply and terminating at the same or another source of supply, and with points to be supplied along the route of the circuit so connected that the supply is available to all of them from both directions along the circuit.

4.15 Ringed Network — A network or part of a network which is wholly or mainly composed of ring circuits, all or most of which individually emanate from and terminate at the same source of supply.

4.16 Ring-Operated Network — A ringed network in which all of the switching devices are normally closed so that all or most of the points to be supplied are each supplied from more than one direction, or a network constructed as a meshed network but operated so that all or most of the points to be supplied are each supplied from more than one direction, but the supplies from alternative sources of supply are only connected by closing switching devices which are normally open.

4.17 Interconnection — Connection, by one or more lines, between two or more systems.

4.18 Neutral Conductor — A conductor connected to the neutral point of a network.

4.19 Feed Point — A point at which a network or a line receives energy.

4.20 Supply Terminals — The point at which a consumer receives energy.

5. ELECTRIC LINES — GENERAL TERMS

5.1 Electric Line — A generic term for a set of conductors, with insulation and accessories, used for the transmission or distribution of electrical energy.

5.2 Transmission (Distribution) Line — Electric line forming part of an installation for transmitting electrical energy, normally restricted to overhead construction.

5.3 Branch Line — A line tapped off a line of greater importance.

5.4 Service Line — A line connecting the consumer's installation to a distributor.

5.5 Feeder — A line which supplies a point of distribution network without being tapped at any intermediate point.

5.6 Conductor (of a Line) — That portion of an electric line which has the specific function of conveying the current.

5.7 Solid Conductor — A conductor composed of a single wire which may be composite.

5.8 Stranded Conductor — A conductor made up of a number of wires twisted together. (When the conductor consists of more than one layer, alternate layers are normally twisted in opposite directions.)

5.9 Shaped Conductor — A conductor the cross-section of which is other than circular.

5.10 Segmental Conductor — A circular conductor made up of components having a cross section approximating to the radial section of an annulus.

5.11 Hollow Conductor — A tubular conductor usually made up of wires or segments twisted helically.

5.12 Transpositing — A change of positions of the conductors of a line carried out in order to establish adequate electrical symmetry of the conductors one to another and with respect to earth or with respect to neighbouring systems.

5.13 Transposition Interval — Length of line section between two successive transpositions.

5.14 Transposition Cycle — On a transposed line, the length of the shortest line section that provides complete electrical symmetry (or minimum asymmetry).

6. OVERHEAD LINES

6.1 Overhead Line — An electric line situated above ground usually with the conductors supported on insulators and appropriate supports.

6.2 Single Circuit Line — An overhead line having only one circuit.

6.3 Double Circuit Line — An overhead line comprising two separate circuits of the same network installed on the same supports.

6.4 Span — The part of an overhead line between two consecutive supports.

6.5 Length of a Span — The horizontal distance between two consecutive supports of an overhead line.

6.6 Conductor Arrangement — Geometrical arrangement of the conductors in relation to the support.

6.7 Angle of Protection — The angle between the vertical plane and a plane through the earth wire, within which the line conductors shall lie in order to ensure a predetermined degree of protection against direct lightning strokes.

6.8 Sag — Maximum vertical distance, in a span of an overhead line, between a conductor and the straight line passing through the two points of support of the conductor.

6.9 Conductor Vibration — Vibration, generally of small amplitude, of the conductors of overhead lines, which can be suppressed by means of appropriate dampers.

6.10 Conductor Dancing — Oscillations, generally of large amplitude, of the conductors of overhead lines which may result, for example, from the sudden breaking away of ice or from strong winds.

6.11 Multiple Conductor; Bundle Conductor — A number of solid or stranded conductors held apart by spacers and connected in parallel.

6.12 Double Conductor; Twin Conductor — A multiple conductor with two solid or stranded conductors.

6.13 Triple Conductor — A multiple conductor with three solid or stranded conductors.

6.14 Earth-Wire — A conductor which is earthed and which is normally situated above the phase conductors.

6.15 Anchorage — Method of fixing a conductor to support whereby forces exerted by each span are independently transmitted to the point of attachment.

6.16 Conductor Clamp — A piece of metal designed to secure a conductor to an insulator or to a support.

6.17 Slip-in-Clamp — A suspension clamp which allows the conductor to slip through it.

6.18 Suspension Clamp — A clamp designed to take up the line of the conductor when angular displacement of a chain of insulators occurs, as in the case of a breakage of the conductor.

6.19 Jumper — A short length of conductor, not under mechanical tension, making an electrical connection between two sections of a conductor of an electric line.

6.20 Conductor Joint — A device for joining together, mechanically and electrically, two lengths of a line conductor.

6.21 Support — A generic term for any device used to support the insulators and the conductors of an overhead line.

6.22 Straight Line Support — A support located within a straight portion of the course of the line.

6.23 Angle Support — A support placed at a point where the line changes in horizontal direction sufficiently to require a special construction to prevent overturning due to the resultant pull of the conductors.

6.24 Anchor Support; Section Support — A support in the run of a line designed to provide against longitudinal load.

6.25 Terminal Support — An anchor placed at the end of a line.

6.26 Tower — A support which may be made of any material, comprising a body which is normally four-sited, with cross-arms.

6.27 Lattice Tower-Pylon — A tower made up of a number of members forming a lattice structure.

6.28 Tower Body — The vertical structure of a tower.

6.29 Pole — A support with one end inserted in the ground, either directly or by means of a separate base. It usually comprises a single member.

6.30 Portal Structure — A support consisting of vertical poles whose upper parts are connected by a cross-arm.

6.31 Stay (Guy) — A rod or wire in mechanical tension attached to a support to prevent overturning.

6.31.1 *Bow Stay* — Where there is no space available to locate a stay, bow stay shall be employed. This consists of a stay wire, turn buckle or stay tightener, stay clamps, anchor plate, stay rod, strain insulator if necessary and brace with 5 cm diameter pulley at one end and clamp at the other end. The stay wire shall be clamped to the pole on the top and the other end to a stay rod embedded in the concrete cement foundation near the pole foundation, the stay wire being passed over the pulley of the brace. The brace shall be clamped in the middle of the pole. Either a turn buckle at the top of the stay wire or stay tightener at the bottom is introduced for tightening stay wire.

NOTE — Strain insulators shall be used in case of reinforced concrete cement pole only.

6.31.2 *Fly Stay* — For overcoming any obstruction, such as road or some structure, fly stay shall be provided. The stay wire shall be clamped to the top of the pole carrying conductors at one end and the other end to the top of another pole of the desired height with the turn buckle near the fly pole. The fly pole shall be buried in the ground crossing the obstruction to a minimum depth of 1·2 m in the same manner as pole carrying conductors. The fly pole shall be provided with a stay in the ordinary way.

NOTE — The fly stay wire shall be taken at such a height as may be directed by Engineer-in-Charge and when road crossing, it shall conform to traffic regulations.

6.31.3 *Bird Guard* — Is a device provided on the cross arm to prevent birds sitting on the cross arm coming in contact with linewise.

6.32 Strut — A rigid member in mechanical compression attached to a support to prevent overturning.

6.33 Bracket — A member projecting from one side of a support of which it is a part or from a wall to which it is directly fixed, and which supports one or several conductors of an overhead line.

6.34 Transverse Support — A transverse member projecting on both sides of a support or joining two uprights, to which the insulators are attached.

6.35 Foundation — A structure set in the ground provided as the base of a tower and to fix it in the ground.

6.36 Stube (of a Tower) — A metal part sealed into the foundation concrete to which a lower leg is fixed.

6.37 Spur — A member fixed in the ground to support a wooden pole clear of all contact with the ground.

6.38 Pin Insulator — An insulator consisting of a single piece of porcelain or of two or more porcelain components permanently connected together and intended to be mounted rigidly on a supporting structure by an insulator pin passing up inside the insulator. Unless otherwise stated, this term excludes the insulator pin.

6.39 Articulated Insulator — Insulator designed for suspension by means of an articulated device.

6.40 Tension Insulator — An insulator which transmits the line conductor tension to an overhead line support.

6.41 Suspension Insulator — An insulator (insulator string) which does not transmit the entire line conductor tension, but merely supports the weight of the conductor.

6.42 Cap and Pin Insulator — An insulator unit having a cap at one end and a pin at the other end where the cap of one insulator in conjunction with the pin of another is used to provide a flexible joint between them.

6.43 Insulator String — A chain of several insulators flexibly connected together.

6.44 Fittings — The portions of an insulator provided for making a mechanical connection to it.

6.45 Arcing Ring — A metal ring placed at the ends of an insulator, or of an insulator string, and having a metallic connection to the conductor or to the support, to form the terminal points of the arc if the insulator flashes over, and to assure a better voltage distribution.

6.46 Lead-In Insulator — An insulator designed for insulating a conductor at the point where it passes through a wall.

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